

AMENDMENTS TO THE CLAIMS

The following listing of claims will replace all prior versions and listings of claims in the application.

LISTING OF CLAIMS

1. (currently amended) A drive system suitable for high bandwidth current control of a three-phase voltage source inverter in its overmodulation region, said system comprising:

a feedback path including a harmonic decoupling block that ~~subtracts~~ extracts each of a plurality of selected harmonic components from signals representative of a corresponding motor phase current signal and subtracts each extracted component from the representative signals to generate corrected feedback signals;

subtractor blocks that subtract the corrected feedback signals from signals representative of open-loop magnetizing reference currents to generate difference signals; and

a modulation block that utilize said difference signals to produce signals to drive ~~[[a]] the~~ three-phase voltage source inverter in an overmodulated six-step mode.

2. (currently amended) A drive system in accordance with Claim 1 wherein said signals representative of a corresponding motor phase current signal are signals in a rotor field reference frame, and said feedback path further comprises:

a coordinate transform block that transforms feedback signals in a stationary reference frame to said rotor-field-reference-frame signals ~~representative, in said rotor field reference frame, of a corresponding motor phase current signal; and~~

~~[[a]] the~~ harmonic decoupling block that subtracts components of at least one 6n order harmonic contained in said rotor-field-reference-frame signals ~~representative, in said rotor field reference frame, of a corresponding said motor phase current signal, to generate the~~ corrected feedback signals;

wherein n is an integer, $n \geq 0$, and said harmonics are relative to a fundamental frequency of ~~[[a]] the~~ phase current of the three-phase voltage source inverter.

3. (original) A drive system in accordance with Claim 2, wherein said harmonic decoupling block subtracts components of at least a sixth order harmonic.

4. (currently amended) A drive system in accordance with Claim 3 wherein said harmonic decoupling block comprises a d-channel block and a q-channel block, and said d-channel block and said q-channel block each comprise:

a first multiplier block that multiplies a first signal input to the harmonic decoupling block by a first sinusoid at a sixth harmonic frequency to generate a base band signal indicative of a sixth harmonic component contained in the first input signal,

a first low-pass filter block that inputs said base band signal and outputs a signal indicative of an average of the sixth harmonic component contained in the first input signal, and

a second multiplier block that multiplies said signal indicative of said sixth harmonic component contained in the first input signal by a second sinusoid at said sixth harmonic frequency to produce a sixth harmonic cancellation component signal;

and said harmonic decoupling block further comprises a subtractor block that subtracts at least the sixth harmonic cancellation signal from one of said rotor-field-reference-frame signals ~~representative, in said rotor field reference frame, of a corresponding said motor phase current signal~~ to produce one of said corrected feedback signals.

5. (currently amended) A drive system in accordance with Claim 4 wherein, in each of said d-channel block and said q-channel block, said first input signal is one of said rotor-field-reference-frame signals ~~representative, in said rotor field reference frame, of a corresponding said motor phase current signal~~.

6. (original) A drive system in accordance with Claim 4 wherein said d-channel block and said q-channel block each further comprise a high pass filter block that filters one of said corrected feedback signals to produce a harmonic containing signal, and wherein said first input signal is said harmonic containing signal.

7. (original) A drive system in accordance with Claim 4 wherein said harmonic decoupling block further comprises a frequency multiplier block that produces said sinusoids at said sixth harmonic frequency utilizing a second signal input to said harmonic decoupling block, wherein said second input signal is representative of a voltage vector signal from a three-phase motor.

8. (currently amended) A drive system in accordance with Claim 7 wherein said first sinusoid utilized by said first multiplier block and said second sinusoid utilized by said second multiplier block are both phase-referenced to said second input signal.

9. (original) A drive system in accordance with Claim 3, wherein said harmonic decoupling block also subtracts components of a twelfth order harmonic.

10. (currently amended) A method for high bandwidth current control of a three-phase voltage source inverter, said method comprising:

~~subtracting~~ extracting each of a plurality of selected harmonic components from signals representative of a motor phase current signal in a feedback path and
subtracting each extracted component from the representative signals to thereby
generate corrected feedback signals;

subtracting corrected feedback signals from signals representative of open-loop magnetizing reference currents to generate difference signals; and

utilizing said ~~different~~ difference signals to produce signals to drive the three phase voltage source inverter in an overmodulated six-step mode.

11. (currently amended) A method in accordance with Claim 10 wherein said signals representative of a ~~corresponding~~ motor phase current signal are signals in a rotor field reference frame, and said method further comprises:

transforming feedback signals in a stationary reference frame to said rotor-field-reference-frame signals ~~representative, in said rotor field reference frame, of a corresponding motor phase current signal; and~~

subtracting components of at least one $6n$ order harmonic contained in said ~~rotor-field-reference-frame~~ signals ~~representative, in said rotor field reference frame, of a corresponding said motor phase current signal~~, to thereby generate the corrected feedback signals;

wherein n is an integer, $n \geq 0$, and said harmonics are relative to a fundamental frequency of a phase current of the three-phase voltage source inverter.

12. (original) A method in accordance with Claim 11, wherein said subtracting components of at least one $6n$ order harmonic comprises subtracting components of at least a sixth order harmonic.

13. (currently amended) A method in accordance with Claim 12 further comprising, for each of a d-channel and a q-channel:

 multiplying a first signal input to a harmonic decoupling block by a first sinusoid at a sixth harmonic frequency to generate a base band signal indicative of a sixth harmonic component contained in the first input signal,

 low-pass filtering said base band signal to output a signal indicative of an average of the sixth harmonic component contained in the first input signal, and

 multiplying said signal indicative of said sixth harmonic component contained in the first input signal by a second sinusoid at said sixth harmonic frequency to produce a sixth harmonic cancellation component signal;

 and said method further comprises subtracting at least the sixth harmonic cancellation signal from one of said ~~rotor-field-reference-frame~~ signals ~~representative, in said rotor field reference frame, of a corresponding said motor phase current signal~~ to produce one of said corrected feedback signals.

14. (currently amended) A method in accordance with Claim 13 wherein, in each of said d-channel and said q-channel, said first input signal is one of said ~~rotor-field-reference-frame~~ signals ~~representative, in said rotor field reference frame, of a corresponding said motor phase current signal~~.

15. (original) A method in accordance with Claim 13 wherein said first input signal is said harmonic containing signal, and further wherein, for each of said d-channel and said q-channel, said method further comprises high pass filtering one of said corrected feedback signals to produce a harmonic containing signal.

16. (original) A method in accordance with Claim 13 further comprising producing said sinusoids at said sixth harmonic frequency utilizing a second signal input to the harmonic decoupling block, wherein said second input signal is representative of a voltage vector signal from a three-phase motor.

17. (currently amended) A method in accordance with Claim 16 wherein said ~~sinusoid utilized by said first multiplier block and said sinusoid utilized by said second multiplier block~~ first and second sinusoids are both phase-referenced to said second input signal.

18. (original) A method in accordance with Claim 12 further comprising said harmonic decoupling block also subtracting components of a twelfth order harmonic.

19. (new) A drive system suitable for high bandwidth current control of a three-phase voltage source inverter in its overmodulation region, said system comprising:

a feedback path including a harmonic decoupling block that, to generate corrected feedback signals:

subtracts selected harmonic components from signals in a rotor field reference frame, said rotor-field-reference-frame signals representative of a corresponding motor phase current signal, and

subtracts components of at least one $6n$ order harmonic contained in said rotor-field-reference-frame signals, wherein n is an integer, $n \geq 0$, and said harmonics are relative to a fundamental frequency of the phase current of the three-phase voltage source inverter;

said feedback path further comprising:

a coordinate transform block that transforms feedback signals in a stationary reference frame to said rotor-field-reference-frame signals;

subtractor blocks that subtract the corrected feedback signals from signals representative of open-loop magnetizing reference currents to generate difference signals; and

a modulation block that utilizes said difference signals to produce signals to drive the three-phase voltage source inverter in an overmodulated six-step mode;

wherein said harmonic decoupling block subtracts components of at least a sixth order harmonic and comprises a d-channel block and a q-channel block each comprising:

a first multiplier block that multiplies a first signal input to the harmonic decoupling block by a first sinusoid at a sixth harmonic frequency to generate a base band signal indicative of a sixth harmonic component contained in the first input signal,

a first low-pass filter block that inputs said base band signal and outputs a signal indicative of an average of the sixth harmonic component contained in the first input signal, and

a second multiplier block that multiplies said signal indicative of said sixth harmonic component contained in the first input signal by a second sinusoid at said sixth harmonic frequency to produce a sixth harmonic cancellation component signal;

and said harmonic decoupling block further comprises a subtractor block that subtracts at least the sixth harmonic cancellation signal from one of said rotor-field-reference-frame signals to produce one of said corrected feedback signals.

20. (new) A method for high bandwidth current control of a three-phase voltage source inverter, said method comprising:

subtracting selected harmonic components from signals representative of a motor phase current signal in a feedback path to thereby generate corrected feedback signals, said representative signals in a rotor field reference frame;

subtracting corrected feedback signals from signals representative of open-loop magnetizing reference currents to generate difference signals;

utilizing said difference signals to produce signals to drive the three phase voltage source inverter in an overmodulated six-step mode;

transforming feedback signals in a stationary reference frame to said rotor-field-reference-frame signals; and

subtracting components of at least a sixth order harmonic contained in said rotor-field-reference-frame signals to thereby generate the corrected feedback signals, wherein said harmonics are relative to a fundamental frequency of a phase current of the three-phase voltage source inverter;

said method further comprising, for each of a d-channel and a q-channel:

 multiplying a first signal input to a harmonic decoupling block by a first sinusoid at a sixth harmonic frequency to generate a base band signal indicative of a sixth harmonic component contained in the first input signal,

 low-pass filtering said base band signal to output a signal indicative of an average of the sixth harmonic component contained in the first input signal,

 multiplying said signal indicative of said sixth harmonic component contained in the first input signal by a second sinusoid at said sixth harmonic frequency to produce a sixth harmonic cancellation component signal; and

 subtracting at least the sixth harmonic cancellation signal from one of said rotor-field-reference-frame signals to produce one of said corrected feedback signals.